Bachelor of Arts (VS)- Insurance Management

Semester VII

Discipline Specific Elective Course -7.3 (Dse-7.3)- Insurance Analytics

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
INSURANCE ANALYTICS (DSE- 7.3)	4	3	-	1	12th	-

Learning Objectives

- Understand key insurance concepts and data flows.
- Apply statistical and machine learning models to insurance data.
- Analyse claims, premiums, customer behaviours, and risk using analytics.
- Utilize dashboards and visualization tools for insurance data reporting.
- Learn to detect fraud and optimize processes in insurance with analytics.

Learning Outcomes: By the end of this course, students will be able to:

- Understand insurance domain data and apply analytical thinking to industry problems.
- Use statistical and ML models to solve real-world insurance problems like pricing and fraud detection.
- Build dashboards and analytical reports using visualization tools.
- Apply predictive and prescriptive models for customer retention, risk profiling, and operational efficiency.
- Evaluate ethical implications of analytics in insurance decision-making.

Course Content **(Theory 45 Hours + 30 hours Practical)**

Unit 1: Introduction to Insurance and Analytics **10 Hours**

Overview of the insurance industry: life, general, and health insurance**,** Insurance data: policy, claims, customer, risk, and underwriting data**,** Introduction to business analytics: descriptive, diagnostic, predictive, prescriptive**.**

Unit 2: Descriptive Analytics in Insurance **10 Hours**

Data summarization and visualization**,** Trend analysis in claims and policy renewals**,** KPI reporting: loss ratio, claim frequency/severity, retention rate**,** Dashboard design for policy and claim metrics.

Unit 3: Predictive Analytics for Risk and Claims **10 Hours**

Predictive modelling in underwriting and pricing**,** Logistic regression for claim prediction**,** Decision trees and random forests for customer churn**,** Time series forecasting for claim volumes**.**

Unit 4: Customer and Fraud Analytics **15 Hours**

Customer segmentation and profiling using clustering (e.g., K-means)**,** Lifetime value (LTV) modelling in insurance**,** Fraud analytics: anomaly detection and classification Use of NLP in detecting fraudulent claims (e.g., text analysis)**.**

Prescriptive Analytics and Optimization: Optimizing pricing and product recommendations**,** Claims process improvement using process analytics**,** Use of simulation techniques in insurance (e.g., Monte Carlo methods)**,** Decision optimization under uncertainty**.**

References:

- Wüthrich, M. V., & Merz, M. (2022). *Statistical foundations of insurance analytics: Machine learning, data science and inference*. Springer. https://doi.org/10.1007/978-3-030-91336-3
- Feldblum, S. (2020). *Principles of insurance analytics*. ACTEX Learning.
- Antonio, K., & Verbelen, R. (2021). *Data science for actuaries: Theory and practice*. Springer.
- Bhattacharya, S. (2021). *AI and analytics in the insurance industry: Trends, tools, and applications*. Springer. https://doi.org/10.1007/978-3-030-69635-8
- Miller, T. W. (2015). *Modeling techniques in predictive analytics: Business problems and solutions with R*. Pearson Education.
- Verbelen, R., Antonio, K., & Claeskens, G. (2018). Unravelling the predictive power of telematics data in car insurance pricing. *Journal of the Royal Statistical Society: Series C (Applied Statistics), 67*(5), 1275–1304. https://doi.org/10.1111/rssc.12291
- Shi, P., & Yang, S. S. (2020). Machine learning in insurance: Applications and challenges. *North American Actuarial Journal, 24*(2), 151–168. https://doi.org/10.1080/10920277.2019.1694821
- Wüthrich, M. V. (2020). Bias correction in insurance pricing with generalized linear models. *European Actuarial Journal, 10*(2), 481–499. https://doi.org/10.1007/s13385-020-00234-0

Practical: The learners are required to:

- Analysing policy performance data of a company of your choice.

- Predicting motor insurance claims for a company of your choice.
- Develop a machine learning-based system for detecting health insurance fraud.
- Design and implement a framework for optimizing policy pricing in life insurance using advanced analytical and computational techniques.
- Design and implement a comprehensive system for data summarization, visualization, and trend analysis in insurance claims and policy renewals, including KPI reporting (e.g., loss ratio, claim frequency and severity, retention rate) and dashboard development for real-time monitoring of policy and claims metrics.
- The learners are required to do practical exercise from unit 1, 2, 3 & 4.

Suggested Tool (Any one) : M.S. Excel, R, Python, Power BI, Tableau

Data Sources

- https://irdai.gov.in/report-and-statistics1
- Annual reports of insurance companies in India